

Swing

12. The golf club according to claim 8, wherein the effective face area is at least 2500 mm² and not more than 5000 mm².

13. The golf club according to claim 8, wherein an effective deflection length being the length of a portion of the face deflectable at the striking of a ball, passing through a sweet spot of the face in a direction perpendicular to the ground, is at least 36 mm and not more than 72 mm.

14. The golf club according to claim 8, wherein the thickness of the face is at least 1.0 mm and not more than 2.5 mm at a sweet spot of the face.

15. The golf club according to claim 8, wherein the elasticity of the face is at least 30 GPa and not more than 210 GPa.

REMARKS

By the *Office Action* of 17 September 2002, Paper No. 7, Claims 1-7 are pending in the Application, and all rejected. By the present *Response and Amendment*, the Applicants amend Claims 1-2, and add new Claims 8-15. No new matter is believed introduced by the present *Response and Amendment*. It is respectfully submitted that the present Application is in condition for allowance for the following reasons.

1. U.S. Patent No. 6,165,081 to Chou

The present invention is an improvement over the Chou-type conventional club head. The Chou device is essentially a two-face-plate club, which such prior art is specifically addressed as distinguishable in the present Application:

U. S. Patent No. 5,863,261 describes first prior art related to the head of a golf club. This literature discloses a head part of a golf club *having two face plates* fixed to each other with a fluid for causing elastic deformation by a *doubler structure* and effectively supplying the energy of the golf club to a ball thereby improving the carry. *Specification, Page 1, Lines 13-16.*

According to the head part of the golf club disclosed in the aforementioned first prior art, it is conceivable to improve the repulsiveness to some extent. However, a great deal of time and labor for connection and a high cost are required for manufacturing the structure having *two face plates* in the first prior art. *Specification, Page 1, Lines 23-26.*

Chou discloses a stopper plate 14 and a trampoline plate 16 (two face plates), that work in conjunction to arrest the deflection of the trampoline plate 16 when the club is swung at speeds in excess of, for example, 160 ft/sec.

Referring now to FIGS. 1-3, trampoline plate 16 is shown in three different positions. Just prior to striking ball 20, trampoline plate 16 is at a rest position and is spaced from stopper plate 14 by a predetermined width or gap 18. At moderate impact speed, the trampoline plate deflects freely, as shown in FIG. 2. That is, upon striking the ball (not shown) trampoline plate 16 deforms and deflects inwardly into gap 18. Due to resiliency, trampoline plate 16 rebounds to give the ball a higher launch velocity. The stopper plate is inactive during moderate impact speed, and behaves transparently to the spring-like action of the trampoline plate. *At the USGA specified high impact speed of 160 ft/sec, however, the deflection of the trampoline plate is arrested by the stopper plate, as shown in FIG. 3.*

More specifically, the stopper plate is inactive at impact velocities below 120-140 ft/sec. At impact velocities of 120-140 ft/sec the gap width is such that upon deflection the trampoline plate just touches the stopper plate. At impact velocities greater than 120-140 ft/sec, particularly at 160 ft/sec, the stopper plate arrests any further deflection of the trampoline plate. *Col. 3, Lines 40-61.*

Not surprisingly, Chou teaches away from a single face construction. While the reference discusses test results of a non-stopper plate head, this test data is expressly used to show the virtues of the two face plate head, and show the deficiencies of the single face construction, which the present invention overcomes.

The effectiveness and advantage of using a stopper plate in a club head may be seen by referring to Tables 1-2, showing the results of a finite-element computer simulation using the third method.

Referring to Tables 1-2, it will be appreciated that a plate thickness of 0.12 inch provides a coefficient of restitution of 0.830 at 160 ft/sec; at a lower velocity of 120 ft/sec, the same plate provides a coefficient of restitution of 0.838. The trampoline plate thickness, however, may be reduced to 0.10 inch, if a stopper plate is placed 1.9 mm behind the trampoline plate. At 160 ft/sec, the coefficient of restitution is again 0.830. But at 120 ft/sec, the coefficient of restitution is 0.858, which is larger than the case without the stopper plate. A larger coefficient of restitution provides a higher launch velocity. *It will be appreciated, therefore, that by the simple method of placing a stopper plate behind the trampoline plate, a higher ball launch*

velocity is achieved for a lower swing speed player using a club head that conforms to USGA regulations. Col. 5, Lines 17-61.

2. The Pending Claims

Claim 1 has been clarified to recite the phrase "coefficient of restitution" as requested by the Examiner, and to further recite that the golf club head does not include a second structure to arrest the deformation of the face, as is taught by Chou. The face is *freely deformable* at a portion of said face at the hit; there is no stopper plate to impede the deformation of the face. The Specification and Drawings of the present Application teach such a one face, freely deformable surface for a head.

The Chou face will contact the stopper plate at impact velocities of greater than approximately 120-140 ft/sec. *Col. 3, Lines 55-61.* Thus, Chou cannot render obvious Claim 1 as clarified, both because Chou teaches away from a freely deformable face, and because the Chou head cannot be modified so it performs as the present head. It would alter the very essence of the Chou device into something that the Chou device is not.

It is evident from above that Chou neither teaches nor suggests a solution to the objectives of the present head since the Chou device is a *two* face head device, the stopper plate (first face) to arrest the hit surface (second face) in game situations.

Claims 2-7, ultimately depending from Claim 1, are believed non-obvious over Chou.

The Examiner objects to Claim 7 as the range of elasticity appears substantially large based on prior art test values. Applicants respectfully submit that the myriad of constructions for a face warrant such a range, and such a range is several times recited in the Specification. As disclosed, the face can comprise a number of presented materials:

The material for the face is not restricted to the aforementioned stainless steel but may alternatively be prepared from another stainless steel such as austenite-based SUS 301, 303, 304, 304N1, 304N2, 305, 309S, 310S, 316, 317, 321, 347 or XM7, martensite-based SUS 410, 420, 431 or 440, precipitation-hardened SUS 630, ferrite-based SUS 405, 430 or 444, soft iron such as S15C, S20C, S25C, S30C or S35C, or special steel such as high tension steel, ultrahigh tension steel, ausforming steel, maraging steel or spring steel. Further alternatively, the material can be prepared from a titanium alloy such as pure titanium I, II, III or IV, an α alloy of 5Al-2.5V, an α - β alloy of 3Al-2.5V, 6Al-4V, 4.5Al-3V-2Fe-2Mo, a β alloy of 15V-3Cr-3Sn-3Al, 10V-2Fe-3Al, 13V-11Cr-3Al, 15Mo-5Zr, 15V-6Cr-4Al,

15Mo-5Zr-3Al, 20V-4Al-1Sn, 22V-4Al or 3Al-8V-6Cr-4Mo-3Zr, an aluminum alloy such as pure aluminum, 2017, 2024, 7075, 3003, 5052, 5056, 6151, 6053 or 6061 or a magnesium-based alloy such as AZ63A, AZ81A, AZ91A, AZ91C, WE54 or EZ33A, while a doubler formed by any combination of these materials is employable. *Specification, Page 5, Line 23 - Page 6, Line 3.*

New Claims 8-15 are presented, and believed non-obvious in view of Chou, as Claim 8 recites that the front-part component and rear-part component are so constructed as to have a hollow structure with a space between them, such that the face is deformable into the hollow structure, free of contact with the rear-part component, when striking a ball. This is neither taught nor suggest in Chou, as Chou discloses the stopper plate to arrest the face deformation.

3. Fees

Presently, the Application has the same number or less than that amount paid for upon original filing. Thus, it is believed no additional Claim fees are due, although authorization to charge deposit account No. 20-1507 is given herein should fees be due.

CONCLUSION

By the present *Response and Amendment*, the Application has been in placed in full condition for allowance. Accordingly, Applicants respectfully request early and favorable action. Should the Examiner have any further questions or reservations, the Examiner is invited to telephone the undersigned Attorney at 404.885.2773.

I hereby certify that this correspondence is submitted via facsimile to Thanh Duong at Group 3700 of the United States Patent and Trademark Office at 703 308 7768

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APPENDIX A

1. (once amended) An iron golf club comprising a head part having a face, wherein
a coefficient of restitution [coefficient] is in the range of at least 0.81 and not more than 0.95 when colliding a ball against a sweet spot in said face at a speed of 44 m/s, and
wherein the face is freely deformable at a portion of said face at the hit.
2. (once amended) The iron golf club according to claim 1, wherein
an effective face area being the surface area of [a] the portion of said face deflectable at the hit is at least 2500 mm² and not more than 5000 mm².
8. (new) A golf club for striking a ball comprising:
a front-part component having a face;
a rear-part component; and
and an effective face area of the face, being the surface area of a portion of the face substantially deflectable when striking a ball;
wherein defined between the front-part component and the rear-part component is a hollow structure with a space such that the effective face area of the face is deformable into the hollow structure, free of contact with the rear-part component, when striking a ball, and
wherein a coefficient of restitution of the effective face area is in the range of at least 0.81 and not more than 0.95 when striking a ball against a sweet spot in the effective face area at a speed of 44 m/s.
9. (new) The golf club according to claim 8, wherein
the rear-part component is a cavity back structure with a sole part having a larger thickness than a top edge part.
10. (new) The golf club according to claim 8, wherein
the front-part component has a concave part provided on its center, a connection part provided on its peripheral edge, and a hosel.
11. (new) The golf club according to claim 8, wherein
the rear-part component has a concave part provided on its center and a connection part provided on its peripheral edge.
12. (new) The golf club according to claim 8, wherein
the effective face area is at least 2500 mm² and not more than 5000 mm².

13. (new) The golf club according to claim 8, wherein

an effective deflection length being the length of a portion of the face deflectable at the striking of a ball, passing through a sweet spot of the face in a direction perpendicular to the ground, is at least 36 mm and not more than 72 mm.

14. (new) The golf club according to claim 8, wherein

the thickness of the face is at least 1.0 mm and not more than 2.5 mm at a sweet spot of the face.

15. (new) The golf club according to claim 8, wherein

the elasticity of the face is at least 30 GPa and not more than 210 GPa.